

## PATENT COOPERATION TREATY

10/009355

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From the INTERNATIONAL BUREAU

NOTIFICATION OF THE RECORDING  
OF A CHANGE(PCT Rule 92bis.1 and  
Administrative Instructions, Section 422)

To:

STYLE, Kelda, Camilla, Karen  
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London WC1N 2LS  
ROYAUME-UNI

Date of mailing (day/month/year) 18 January 2002 (18.01.02)	IMPORTANT NOTIFICATION
Applicant's or agent's file reference 101657/KCS/DG	
International application No. PCT/EP00/03699	International filing date (day/month/year) 26 April 2000 (26.04.00)

## 1. The following indications appeared on record concerning:

☒ the applicant
 ☐ the inventor
 ☐ the agent
 ☐ the common representative

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## 2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

☐ the person
 ☒ the name
 ☐ the address
 ☐ the nationality
 ☐ the residence

## Name and Address

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## State of Nationality

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## State of Residence

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## 3. Further observations, if necessary:

## 4. A copy of this notification has been sent to:

☒ the receiving Office
 ☐ the designated Offices concerned  
☐ the International Searching Authority
 ☒ the elected Offices concerned  
☐ the International Preliminary Examining Authority
 ☐ other:
The International Bureau of WIPO  
34, chemin des Colombettes  
1211 Geneva 20, Switzerland

Authorized officer

Ingrid AULICH

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Telephone No.: (41-22) 338.83.38

## PATENT COOPERATION TREATY

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## NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

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 United States Patent and Trademark  
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 Arlington, VA 22202  
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 in its capacity as elected Office

Date of mailing (day/month/year) 15 December 2000 (15.12.00)	
International application No. PCT/EP00/03699	Applicant's or agent's file reference 101657/KCS/DG
International filing date (day/month/year) 26 April 2000 (26.04.00)	Priority date (day/month/year) 12 May 1999 (12.05.99)
Applicant TOSKALA, Antti	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:

30 October 2000 (30.10.00)

☐ in a notice effecting later election filed with the International Bureau on:2. The election ☒ was☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer Pascal Piriou Telephone No.: (41-22) 338.83.38
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## PATENT COOPERATION TREATY

## PCT

REC'D 28 AUG 2001

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## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 101657/KCS/SC	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/EP00/03699	International filing date (day/month/year) 26/04/2000	Priority date (day/month/year) 12/05/1999
International Patent Classification (IPC) or national classification and IPC H04B7/02		
Applicant NOKIA NETWORKS OY et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.



2. This REPORT consists of a total of 6 sheets, including this cover sheet.

- ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 5 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☒ Certain observations on the international application

Date of submission of the demand  30/10/2000	Date of completion of this report  24.08.2001
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer  Fribert, J  Telephone No. +49 89 2399 8959 

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/EP00/03699

## I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

### Description, pages:

1,3-13	as originally filed	
2,2a, 5	with telefax of	14/06/2001

### Claims, pages:

14,15	as originally filed	
16,17	with telefax of	14/06/2001

### Drawings, sheets:

1/2,2/2	as originally filed	
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2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/EP00/03699

4. The amendments have resulted in the cancellation of:

- ☐ the description,      pages:
- ☐ the claims,      Nos.:
- ☐ the drawings,      sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

## V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-23
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-16, 20-23
	No:	Claims	17-19
Industrial applicability (IA)	Yes:	Claims	1-23
	No:	Claims	

2. Citations and explanations  
**see separate sheet**

## VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:  
**see separate sheet**

## VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:  
**see separate sheet**

Reference is made to the following document:

D1: EP-A-0 577 322 (NOKIA MOBILE PHONES LTD) 5 January 1994

**Re Item V**

**Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Document D1, which is considered to represent the most relevant state of the art, discloses (cf. e.g. column 3, lines 39-55 and Figs. 1 and 2) a network comprising a plurality of first stations (BTS) and a plurality of second stations (MS), each of said first stations being connected to a control element (BSC), wherein at least one of said first stations (e.g. BTS1) is connected to one control element (e.g. MSC1) and at least one of the first stations (e.g. BTS2) being connected to a different control element (e.g. MSC2).

According to D1 (cf. e.g. column 1, lines 1-12), Fig. 1 shows a cellular network constructed in a way known per se. According to D1 (cf. column 2, lines 24-27) several base stations may send the same signal to a mobile station using the same code, and the moving station receives the signals like signals coming through multipath propagation.

Given this information and considering Fig. 1, the skilled person would immediately consider the two base stations connected to the controller BSC1 or the three base stations connected to BSC3 as operating in such a simulcast manner.

The object of D1 is to overcome problems occurring during handover from one cell to another (i.e. from a base station controlled by BSC1 to a base station controlled by BSC2) as shown in Fig. 2. It is at least obvious to the person skilled in the art that Fig. 2 shows a portion of the network depicted in Fig. 1 in more detail, so that the other base station and base station controllers shown in Fig. 1 would be present in the network according to Fig. 2 as well but have merely been left out for clarity purposes in order to show the problems of inter-cell handover only, which D1 seeks to overcome.

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

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International application No. PCT/EP00/03699

Thus, the most obvious way for the skilled person to interpret the disclosure of D1 is, that the first stations (BTS) transmit identical control information to said second station (MS), when a second station is in communication with a plurality of first stations (BTS) controlled by the some control element (e.g. BSC1), and the control information transmitted by said first stations (BTS1 and BTS2) to said second station (MS) is different (cf. column 7, lines 4-10), when a second station is in communication with a plurality of first stations which are controlled by a plurality of different control elements (BSC1 and BSC2) .

2. Thus, the present application does not satisfy the criterion set forth in Article 33(3) PCT because the subject-matter of claim 17 does not involve an inventive step (Rule 65(1)(2) PCT).
3. Dependent claims 18 and 19 do not contain any steps or features which, in combination with the features of claim 17 to which they refer, meet the requirements of the PCT in respect of inventive step, the reasons being as follows:

The subject-matter of claim 18 is a matter of course to a person skilled in the art. Furthermore, the subject-matter of both claim 18 and claim 19 is known from D1 when applied to a CDMA system (cf. e.g. column 8, lines 30-33).

4. The subject-matter of dependent claims 20-22, according to which the amount of control information differs as well is neither known nor rendered obvious by the available prior art.
5. The subject-matter of independent claims 1 and 23 differs from that of claim 17 basically in that not only the associated information but also the data content of the signals differ when the first stations are connected to different control elements.

This feature and the corresponding steps are not known from any of the available prior art documents and are thus not rendered obvious.

Claims 2-16 are dependent on claim 1 and are thus also rendered novel and inventive.

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

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International application No. PCT/EP00/03699

**Re Item VII**

**Certain defects in the international application**

1. The independent claims are not in the two-part form in accordance with Rule 6.3(b) PCT, which in the present case would be appropriate, with those features known in combination from the prior art (document D1) being placed in a preamble (Rule 6.3(b)(i) PCT) and with the remaining features being included in a characterising part (Rule 6.3(b)(ii) PCT).
2. The features of the claims are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).

**Re Item VIII**

**Certain observations on the international application**

1. The various definitions of the invention given in independent claims 1, 17 and 23 are such that the claims as a whole are not clear and concise, contrary to Article 6 PCT, since the plurality of independent claims makes it difficult, if not impossible, to determine the matter for which protection is sought, and places an undue burden on others seeking to establish the extent of the protection.



provided between a mobile station and a base station. One of these connections is for speech whilst the other is for data. The soft handoff scenario described hereinbefore has been proposed in the context of speech connections. The use of soft handoff with data is difficult to successfully implement and so it has been proposed that even if the mobile station is in soft handoff with two or more base stations for speech connections, the mobile station should only communicate with a single base station for the data connection.

The inventor has appreciated that this proposal has problems in certain soft handoff situations. These problems will occur when the two base stations with which a mobile station is in communication are under the control of different radio network controllers. The radio network controllers provide control information to the base stations for forwarding to a mobile station. This information indicates if speech and/or data is present and associated rate information. For successful combining in the mobile station when in soft handoff, this information should not contradict. If one base station under the control of one radio network controller indicates that speech and data are being sent to the mobile station and a second base station under the control of a different radio network controller indicates to the same mobile station that only speech is being sent to the mobile station, the mobile station will not be able to successfully combine the received speech. The mobile station may also assume that there is no data information as the mobile station has only been advised that there is data information by one base station. As this information is only received from one base station, the mobile station may assume that the information from the base station is unreliable and that there is in fact no data.

#### Summary of the invention

It is an aim of embodiments of the present invention to address this problem.

the some control element, the first stations transmit identical control information to said second station and, in a second mode, when a second station is in communication with a plurality of first stations which are controlled by a plurality of different control elements, the control information transmitted by said first stations to said second station is different, said control information being used by said second station in said first and second modes to control the processing carried out by the second station in respect of signals received from said plurality of first stations.

The control information may be in accordance with the first coding in the first mode and in accordance with the second coding in the second mode.

The first coding may have a first number of symbols available using a first number of bits and said second coding may have a second number of symbols available using a second number of bits, wherein the first number of symbols is greater than the second number of symbols. The control information may comprise a first number of code words in the first mode and a second number of code words in the second mode, said first number of code words being less than the second number of code words. For example, one code word may be used in the first mode and two or more code words may be used in the second mode.

Preferably, the number of bits defining the or each code word in the first mode is different to that of the or each code word in the second mode. The number of bits in the first mode for a code word is preferably greater than that in the second mode.

#### **Brief description of the drawings**

For a better understanding of the present invention and as to how the same may be carried into effect, reference will now be made by way of example to the accompanying drawings in which:

Figure 1 shows a schematic diagram of part of a cellular telecommunications network incorporating base transceiver

17. A network comprising a plurality of first stations and a plurality of second stations, each of said first stations being connected to a control element, wherein at least one of said first stations is connected to one control element and at least one of the first stations being connected to a different control element, wherein, in a first mode, when a second station is in communication with a plurality of first stations controlled by the same control element, the first stations transmit identical control information to said second station and, in a second mode, when a second station is in communication with a plurality of first stations which are controlled by a plurality of different control elements, the control information transmitted by said first stations to said second station is different.

18. A network as claimed in claim 17, wherein said control information being used by said second station in said first and second modes to control the processing carried out by the second station in respect of signals received from said plurality of first stations.

19. A network as claimed in claim 17 or 18, wherein said control information is in accordance with a first coding in the first mode and in accordance with a second coding in the second mode.

20. A network as claimed in claim 17, 18 or 19, wherein said first coding has a first number of symbols available using a first number of bits and said second coding has a second number of symbols available using a second number of bits, wherein said first number of symbols is greater than said second number of symbols.

21. A network as claimed in claim 17, 18, 19 or 20, wherein the control information comprises a first number of code words in the first mode and a second number of code words in the second mode, said first number of code words being less than said second number of code words.

22. A network as claimed in claim 21, wherein the number of bits defining the or each code word in the first mode is different to

that of the or each code word in the second mode.

23. A method of transmitting signals from a plurality of first stations to the same second station, said method comprising the steps of:

transmitting first signals including first associated information from one of said plurality of first stations to said second station;

transmitting second signals including second associated information, differing at least partially from said first associated information from another of said plurality of first stations to said second station, said second signals at least partially differing from said first signals; and

receiving at said second station said first and second signals, wherein said second station processes said first and second signals in accordance with the first and second associated information.



## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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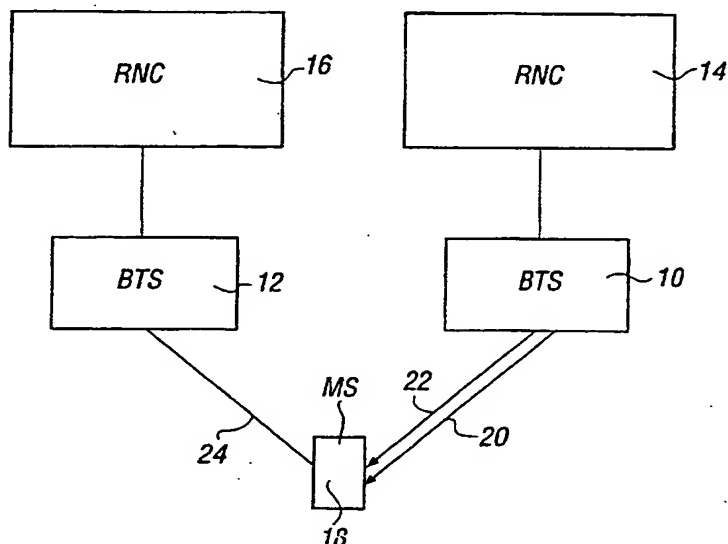
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Published

With international search report.

(54) Title: METHOD FOR TRANSMITTING SIGNALS FROM A PLURALITY OF BASE STATIONS TO A MOBILE STATION



## (57) Abstract

A method of transmitting signals from a plurality of first stations to the same second station, said method comprising the steps of transmitting first signals comprising a first communication and first associated information from one of said plurality of first stations to said second station; transmitting second signals comprising said first communication, a second communication and second associated information, said second associated information differing at least partially from said first associated information, from another of said plurality of first stations to said second station; and receiving at said second station said first and second signals, wherein said second station processes said first and second signals in accordance with the first and second associated information.

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2/PATS

## METHOD FOR TRANSMITTING SIGNALS FROM A PLURALITY OF BASE STATIONS TO A MOBILE STATION

### Field of the invention

The present invention relates to a transmitting method and in particular, but not exclusively, to a method of transmitting signals from a plurality of base stations to a mobile station in a wireless cellular telecommunications network.

### Background of the invention

The use of code division multiple access (CDMA) is being proposed for the next generation of cellular telecommunication networks. Additionally, code division multiple access is also being used in the IS-95 Standard in the USA. CDMA is a direct sequence spread spectrum technique. In a wireless cellular network using CDMA, the mobile terminals in one cell associated with a first base station will use the same frequency as mobile stations in an adjacent cell associated with a second base station. The different mobile stations can be distinguished by the respective base stations as each mobile station will be using a different spreading code.

In US-A-5101501 a CDMA system is described which uses "soft" handoff. With soft handoff, a mobile station is capable of communicating with more than one base station at the same time. This will typically occur when the mobile station is close to the boundary defined between two cells. The signals sent by the mobile stations will be received and processed by both of the base stations. Likewise, the mobile station will receive the same signal from the two base stations. The signals from the two base stations may be combined. The combined signal may provide better quality than the individual signals received by the mobile station.

It has also been proposed that two parallel connections be

provided between a mobile station and a base station. One of these connections is for speech whilst the other is for data. The soft handoff scenario described hereinbefore has been proposed in the context of speech connections. The use of soft handoff with data is difficult to successfully implement and so it has been proposed that even if the mobile station is in soft handoff with two or more base stations for speech connections, the mobile station should only communicate with a single base station for the data connection.

The inventor has appreciated that this proposal has problems in certain soft handoff situations. These problems will occur when the two base stations with which a mobile station is in communication are under the control of different radio network controllers. The radio network controllers provide control information to the base stations for forwarding to a mobile station. This information indicates if speech and/or data is present and associated rate information. For successful combining in the mobile station when in soft handoff, this information should not contradict. If one base station under the control of one radio network controller indicates that speech and data are being sent to the mobile station and a second base station under the control of a different radio network controller indicates to the same mobile station that only speech is being sent to the mobile station, the mobile station will not be able to successfully combine the received speech. The mobile station may also assume that there is no data information as the mobile station has only been advised that there is data information by one base station. As this information is only received from one base station, the mobile station may assume that the information from the base station is unreliable and that there is in fact no data.

#### Summary of the invention

It is an aim of embodiments of the present invention to address this problem.



According to a first aspect of the present invention, there is provided a method of transmitting signals from a plurality of first stations to the same second station, said method comprising the steps of transmitting first signals comprising a first communication and first associated information from one of said plurality of first stations to said second station; transmitting second signals comprising said first communication, a second communication and second associated information, said second associated information differing at least partially from said first associated information, from another of said plurality of first stations to said second station; and receiving at said second station said first and second signals, wherein said second station processes said first and second signals in accordance with the first and second associated information.

The first communication or type of communication may comprise speech. Alternatively, the first communication may comprise any other suitable data. As the first communication is transmitted by two different first stations to the same second station, the second station is in soft handoff with respect to the first communication. The first communications may be provided on dedicated channels. Alternatively, the first communications may be provided on shared channels.

The second communication or type of communication may be data or any other suitable information. The second communication is only provided by one of the first stations to the second station. Accordingly, that second communication is not in a soft handoff situation with respect to the second communication. Preferably, the second communication is provided in a shared channel. Alternatively, a dedicated channel may be provided for the second communication.

The first and/or second associated information may comprise information on the rate of the respective first and second signals. Alternatively or additionally, the first and/or second

associated information may comprise information which is required in order to successfully process the received signals.

Preferably, the first and/or second associated information may comprise at least one code word. Preferably, a code word is provided for the first communication and a different code word is provided for the second communication.

The first and/or second associated information may comprise first information associated with the first communication and second information associated with the second communication. As mentioned hereinbefore, that first and second information may comprise respective code words. Preferably, the first and second associated information comprises the same information in respect of the first communication.

One of the first and second stations may comprise a base station. Preferably, one of the first and second stations comprises a mobile station. The first stations are preferably base stations and the second station is preferably a mobile station.

In preferred embodiments of the present invention, the first and second stations communicate using the code division multiple access technique. The first and second communications may use different spreading codes.

At least two of the first stations may be connected to different control elements, the control elements defining the first and/or second associated information. These control elements may be radio network controllers.

According to a second aspect of the present invention, there is provided a network comprising a plurality of first stations and a plurality of second stations, each of said first stations being connected to a control element, wherein at least one of said first stations is connected to one control element and at least one of the first stations being connected to a different control element, wherein, in a first mode, when a second station is in communication with a plurality of first stations controlled by

the some control element, the first stations transmit identical control information to said second station and, in a second mode, when a second station is in communication with a plurality of first stations which are controlled by a plurality of different control elements, the control information transmitted by said first stations to said second station is different, said control information being used by said second station in said first and second modes to control the processing carried out by the second station in respect of signals received from said plurality of first stations.

The control information may be in accordance with the first coding in the first mode and in accordance with the second coding in the second mode.

The first coding may have a first number of symbols available using a first number of bits and said second coding may have a second number of symbols available using a second number of bits, wherein the first number of symbols is greater than the second number of symbols. The control information may comprise a first number of code words in the first mode and a second number of code words in the second mode, said first number of code words being less than the second number of code words. For example, one code word may be used in the first mode and two or more code words may be used in the second mode.

Preferably, the number of bits defining the or each code word in the first mode is different to that of the or each code word in the second mode. The number of bits in the first mode for a code word is preferably greater than that in the second mode.

#### Brief description of the drawings

For a better understanding of the present invention and as to how the same may be carried into effect, reference will now be made by way of example to the accompanying drawings in which:

Figure 1 shows a schematic diagram of part of a cellular telecommunications network incorporating base transceiver

stations and mobile stations;

Figure 2 shows part of the network of Figure 1 in more detail; and

Figure 3 illustrates the coding used in embodiments of the present invention.

#### Detailed description of embodiments of the invention

Reference will first be made to Figure 1 in which three cells 2 of a cellular telecommunications network are shown. Each cell 2 is served by a respective base transceiver station (BTS) 4. Each base transceiver station 4 is arranged to transmit signals to and receive signals from the mobile stations 6 located in the cell associated with the given base transceiver station 4. Likewise, each mobile station 6 is able to transmit signals to and receive signals from the respective base transceiver station 4.

The cellular telecommunications network shown in Figure 1 uses a code division multiple access technique. Accordingly, at least some of the mobile stations will be in communication with more than one base station at the same time. This, however, will be described in more detail hereinafter.

Reference is now made to Figure 2 which shows two base stations 10 and 12 which serve adjacent cells. The first base station 10 is connected to a first radio network controller 14 whilst the second base station 12 is connected to a second radio network controller 16. In practice each of the first and second radio network controllers 14 and 16 will be connected to more than one base station. However for clarity, only one base station is shown as being connected to each radio network controller.

In the scenario illustrated in Figure 2, a mobile station 18 is in communication with both the first and the second base stations 10 and 12 at the same time and is therefore in soft handoff. The cells of the first and second base stations can be regarded as overlapping with the mobile station 18 being in the region of overlap.

The mobile station 18 has a downlink speech connection 20 and a downlink data connection 22 with the first base station 10, these connections being in parallel. The speech connections may, but not necessarily be a dedicated connection and is sometimes referred to as a downlink channel. The data connection via these embodiments is a downlink shared channel and is also used by the first base station 10 for other communications with different mobile stations. Alternatively, the data connection may be a dedicated channel. The speech and data connections use different spreading codes so that the two connections (channels) can be distinguished. The spreading factor (i.e. processing gain) may also differ for the speech and data connections.

Control information for the mobile station 18 from the first base station 10 is multiplexed with the speech on the speech connection and therefore uses the same code as the speech connection.

The mobile station 18 has a downlink speech connection 24 with the second base station 12 and no data connection. The speech connection 24 between the mobile station 18 and the second base station 12 uses the same spreading factor as the speech connection between the first base station 10 and the mobile station 18. Once again, the control information will be multiplexed with speech on the speech connection and a single spreading code is used. The speech connection may be regarded as a dedicated physical data channel whilst the control information may be regarded as being provided by a dedicated physical control channel.

Whilst the speech information transmitted by the first and second base stations 10 and 12 to the mobile stations is the same, the control information may be the same or different. The control information includes information such as power control information for controlling the power with which the mobile station 18 transmits. The control information also includes TFCI information as will be discussed hereinafter. The control

information may include pilot signals or symbols which act as a reference for certain purposes.

The control information is time multiplexed onto the speech channel (i.e. the dedicated downlink physical channel) and thus uses the same spreading code.

Data blocks are transmitted between the radio network controllers 14 and 16 and the respective base stations 10 and 12 using a frame protocol FP. The data may be speech or conventional data. A frame contains data which is to be transmitted in one interleaving period and a transport format indicator TFI. The interleaving period is the period over which data is interleaved. The transport format indicator TFI provides information as to the format of the data frame such as the size of the data block, the interleaving period and the like.

Each mobile station has an independent transport connection which means that each frame contains the data and current transport format indicator TFI of one bearer only. One bearer is the speech, another bearer is the data and yet another bearer is the signalling. For downlink communications (from the radio network controller to the base station direction), the data blocks of users having the same user equipment are multiplexed onto a single radio link. The manner in which the multiplexing is done will depend on the transport format indicator TFI of each frame which indicates the amount of data in each frame for the bearers. The multiplexing takes place with the blocks which are to use the same spreading code.

A transport format combination information TFCI field of the radio frame provided in a dedicated physical control channel DPCCCH will indicate the manner in which the multiplexing is carried out. The transport format combination information TFCI field will indicate the transport format indicator TFI for each of the bearers whose data is multiplexed in the radio frame or frames in the dedicated physical data channel DPDCH. Each frame has incorporates two code slots, one for shared channels and one for the unshared channels. The TFCI information provides

information on the rate associated with the speech and data respectively.

The rate information thus defines the interleaving performed as well as the form of channel coding.

When the mobile station 18 is in communication with two base stations 10 and 12 which are controlled by different radio network controllers 14 and 16, the TCFI coding is modified as follows. A first type of coding is used for the TCFI coding in this scenario. In this embodiment 16.5 coding is used. This means that there are 16 possible symbols which are represent by 5 bits.

Each of the base stations will send one or two code words, each having a maximum length of 5 bits. These code words are formulated by the respective radio network controller. Reference is made to Figure 3 which shows four examples of the two words which are received by the mobile station. The first word, WORD 1, is transmitted by both the first base station 10 and the second base station and relates to the speech connection. The same information WORD 1 for the speech connections will be sent to the mobile station 18 from the first and second base stations 10 and 12. This is because the same speech information is sent to the mobile station from both the first and second base stations 10 and 12.

A second word WORD 2 relates to any data connection. The first base station 10 sends WORD 2 to the mobile station 16. As there is no data connection between the second base station and mobile station 18 one of the following occurs: instead of a second code word, WORD 2, the second base station sends a series of zeros or the like, representing the second word. Alternatively, the second base station may not send the second word WORD 2. Accordingly, the mobile station may only receive one version of the second code word, WORD 2 from the first base station or a second version with zeros or the like. In the latter case, the two second words WORD 2 can be combined so the effects of the connection where there is no data are ignored. This may be used to confirm that there is only one data connection.

The first word contains the TCFI information for the speech connection between the first base station 10 and the mobile station 18 and between the second base station 2 and the mobile station 18. The TCFI information is the same from both the first and the second base stations.

The second word contains TCFI information for the data connection between the first base station 10 and the mobile station 18. There is no TCFI information from the second base station 12 for a data connection.

Figure 3 shows examples where the total number of TFCI bits received by the mobile station is 7, 8, 9 and 10. As can be seen from these examples, it is not necessary to use all of the available bits of each code word. For example, in one version of the second word, WORD 2, all bits are used, in another four bits, in another three bits and in another two bits. Only one bit may also be used. The position of the unused bit or bits may vary. The first word, WORD 1 may vary. The first word, WORD 1 may similarly use only some of the available bits.

The mobile station uses the TCFI information in order to process the speech and data connections as required. For example, the rate information may mean the speech or data has been interleaved and encoded in a certain manner. The mobile station uses the rate information to determine the deinterleaving process and decoding to be carried out.

Where the mobile station is in communication with two base stations which are controlled by the same radio network controller, the mobile station receives the same TCFI information from both of the base stations for each connection. The TCFI information will use a different coding. In this embodiment the different coding will be 32.6 coding. This means that there are 32 possible symbols which are represented by 6 bits. There is of course only a single code word of six bits which is transmitted by each of the base stations.



In alternative embodiments of the present invention, other types of coding can be used.

Embodiments of the present invention have the advantage that where two radio network controllers are involved, one of which controls the downlink channel and the other of which controls the downlink shared channel, the benefits of fast signalling on the downlink shared channel can be retained even where the radio network controllers are in different locations.

The data connection TCFI code word (which may be in respect of a shared channel) will not have the gain associated with soft handoff but this also applies to the data itself.

This method described with reference to Figure 3 has the advantage that a control loop between radio network controllers is not required, reducing traffic in the network.

The signalling information i.e. the TCFI information relating to the speech connection will have the same soft handoff gain associated with the speech connection.

There is an alternative solution to the problem where different base stations which are in communication with the same mobile station and the base stations are controlled by different radio network controllers. That solution is to connect the two radio network controllers to each other so that the same TCFI coding is sent by both of the base stations. This solution may be advantageous where the radio network controllers are in the same location. If the radio network controllers are not in the same location, this solution may be disadvantageous in that a delay is introduced. This delay is a result of the time taken for the two radio network controllers to signal to each other before transmission can begin.

In one embodiment of the present invention the method described in relation to Figure 3 is used if the radio network controllers

are not in the same location whilst the alternative method is used if the radio network controllers are in the same location. In other embodiments the method described in relation to Figure 3 is used regardless of the location of the radio network controllers in question.

The format described hereinbefore is part of the currently proposed UMTS (universal mobile telephone service) standard. It should be appreciated that any other standard can alternatively be used.

The control information can in alternative embodiments of the present invention be sent on a separate connection or channel to the speech data.

In alternative embodiments of the present invention, the speech may be replaced by any other suitable form of communication. In other words, any other suitable communication type including some data connections may be in soft handoff as required and used in embodiments of the invention. Likewise, the data can be replaced by any other suitable form of communication, where soft handoff is not desirable. The data may be packet data or any other type of data.

It is also possible that the dedicated channel is only maintained to support handover or the like and only contain signalling information. In this case the first word WORD 1, would refer to the existence of the higher level control information.

In some embodiments of the present invention, the mobile station may be in communication with more than two base stations at the same time. The principles outlined hereinbefore can also be used in this scenario. Each base station can be connected to a different radio network controller. Alternatively, one or more of the radio network controllers can be connected to more than one base station which is in communication with the same mobile station.

Whilst preferred embodiments have been described in the context of a code division multiple access system, embodiments of the present invention can be used with any other spread spectrum technique or any other suitable access technique such as time division multiple access, frequency division multiple and space division multiple access as well as hybrids thereof.

CLAIMS:

1. A method of transmitting signals from a plurality of first stations to the same second station, said method comprising the steps of:

transmitting first signals comprising a first communication and first associated information from one of said plurality of first stations to said second station;

transmitting second signals comprising said first communication, a second communication and second associated information, said second associated information differing at least partially from said first associated information, from another of said plurality of first stations to said second station; and

receiving at said second station said first and second signals, wherein said second station processes said first and second signals in accordance with the first and second associated information.

2. A method as claimed in claim 1, wherein said first communication comprises speech.

3. A method as claimed in claim 1, wherein said first communication comprises signalling information only.

4. A method as claimed in claim 1, 2 or 3, wherein said first communication is provided on dedicated channels.

5. A method as claimed in any preceding claim, wherein said second communication is data.

6. A method as claimed in any preceding claim, wherein said second communication is provided in a shared channel.

7. A method as claimed in any of the preceding claims wherein said first and/or said second associated information comprise information on the rate of the respective first and second

signals.

8. A method as claimed in any preceding claim, wherein said first and/or said second associated information comprise at least one code word.

9. A method as claimed in any preceding claim, wherein said first and/or said second associated information comprises first information associated with the first communication and second information associated with the second communication.

10. A method as claimed in any preceding claim, wherein first and second associated information comprise the same information in respect of the first communication.

11. A method as claimed in any one of the preceding claims, wherein one of said first and second stations comprises a base station.

12. A method as claimed in any one of the preceding claims, wherein one of said first and second stations comprises a mobile station.

13. A method as claimed in any one of the preceding claims, wherein said first and second stations communicate using the code division multiple access technique.

14. A method as claimed in claim 13 wherein said first and second communications use different spreading codes.

15. A method as claimed in any one of the preceding claims wherein at least two of said first stations are connected to different control elements, said control elements defining the first and/or second associated information.

16. A method as claimed in claim 15, wherein said elements comprise radio network controllers.

17. A network comprising a plurality of first stations and a plurality of second stations, each of said first stations being connected to a control element, wherein at least one of said first stations is connected to one control element and at least one of the first stations being connected to a different control element, wherein, in a first mode, when a second station is in communication with a plurality of first stations controlled by the same control element, the first stations transmit identical control information to said second station and, in a second mode, when a second station is in communication with a plurality of first stations which are controlled by a plurality of different control elements, the control information transmitted by said first stations to said second station is different.

18. A network as claimed in claim 17, wherein said control information being used by said second station in said first and second modes to control the processing carried out by the second station in respect of signals received from said plurality of first stations.

19. A network as claimed in claim 17 or 18, wherein said control information is in accordance with a first coding in the first mode and in accordance with a second coding in the second mode.

20. A network as claimed in claim 17, 18 or 19, wherein said first coding has a first number of symbols available using a first number of bits and said second coding has a second number of symbols available using a second number of bits, wherein said first number of symbols is greater than said second number of symbols.

21. A network as claimed in claim 17, 18, 19 or 20, wherein the control information comprises a first number of code words in the first mode and a second number of code words in the second mode, said first number of code words being less than said second number of code words.

22. A network as claimed in claim 21, wherein the number of bits defining the or each code word in the first mode is different to

that of the or each code word in the second mode.

23. A method of transmitting signals from a plurality of first stations to the same second station, said method comprising the steps of:

transmitting first signals including first associated information from one of said plurality of first stations to said second station;

transmitting second signals including second associated information, differing at least partially from said first associated information from another of said plurality of first stations to said second station, said second signals at least partially differing from said first signals; and

receiving at said second station said first and second signals, wherein said second station processes said first and second signals in accordance with the first and second associated information.

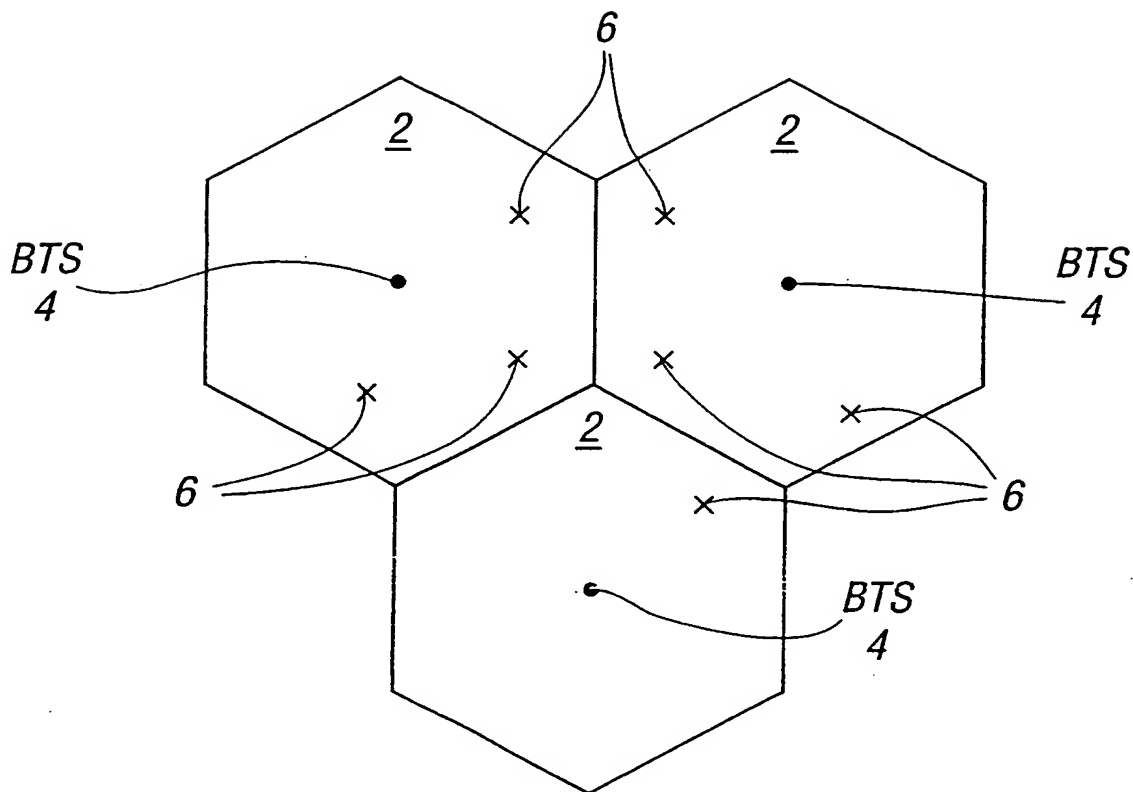


FIG. 1



2/2

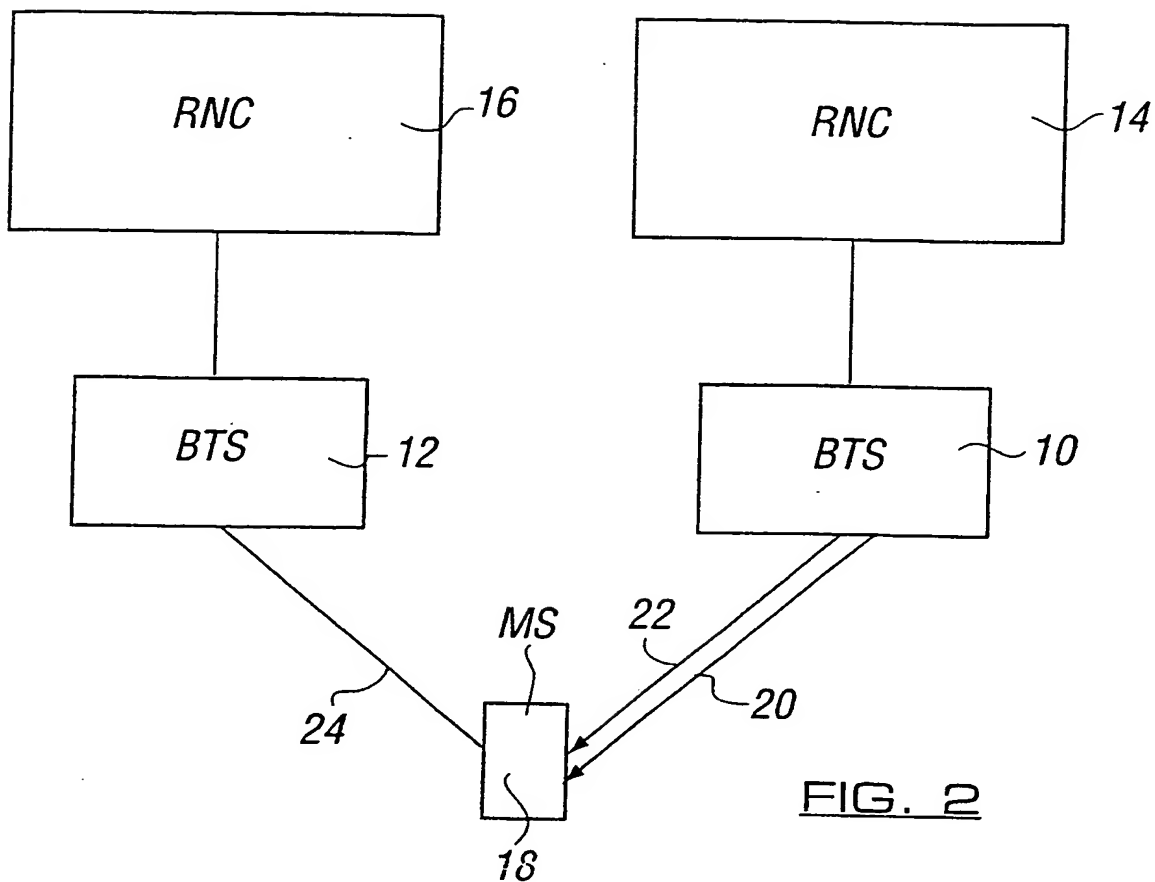


FIG. 2

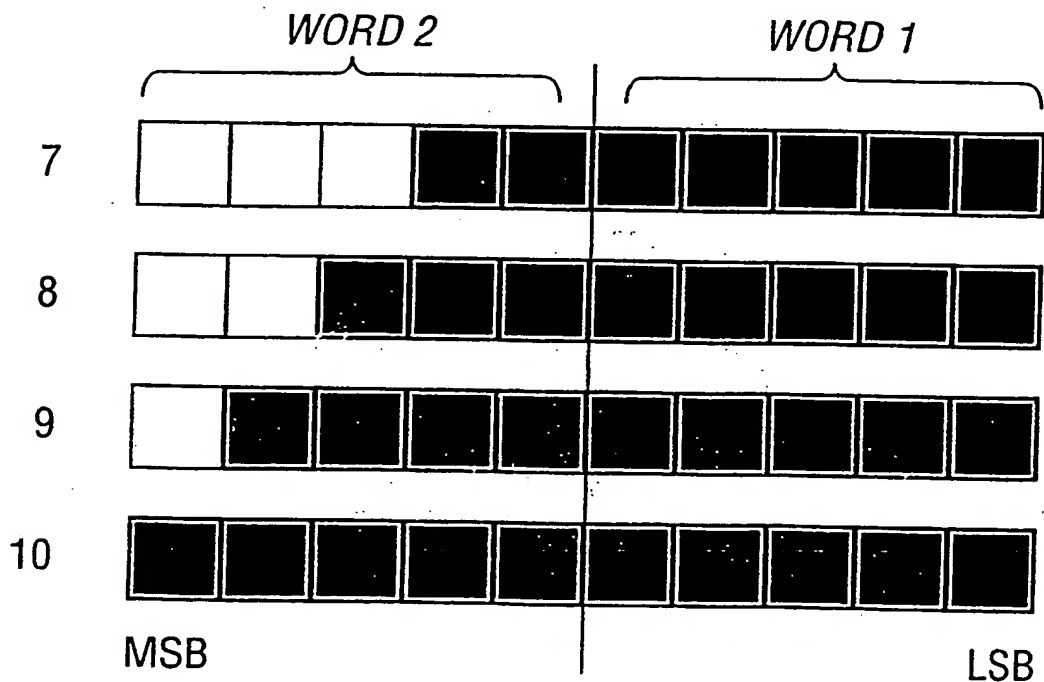


FIG. 3

## INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 00/03699

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 H04B7/02 H04Q7/38

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H04B H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, INSPEC, WPI Data

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 577 322 A (NOKIA MOBILE PHONES LTD) 5 January 1994 (1994-01-05) column 3, line 39 - line 59 column 7, line 2 - line 10 column 8, line 30 - line 39 figure 2	1, 11-16, 23
A	---	17
A	MITTS H: "IMPLICATIONS OF MACRO DIVERSITY ON UMTS/B-ISDN INTEGRATION" GLOBAL TELECOMMUNICATIONS CONFERENCE (GLOBECOM), US, NEW YORK, IEEE, 1996, pages 1674-1678, XP000748735 ISBN: 0-7803-3337-3 the whole document --- -/--	1-23



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

## \* Special categories of cited documents :

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"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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Date of the actual completion of the international search

22 August 2000

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## INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 00/03699

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Information on patent family members

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